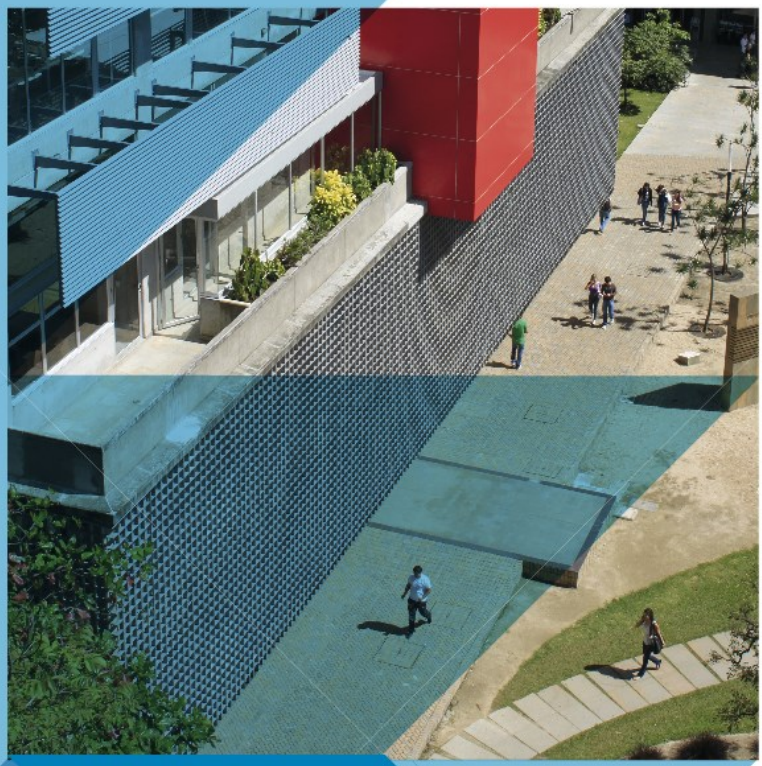

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An Uphill Battle: The Relationship Between Geography and Terrorism

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An Uphill Battle: The Relationship Between Geography and Terrorism

Felipe Bedoya-Maya, Gustavo Canavire-Bacarreza,
Alejandra Montoya-Agudelo *

Abstract

Regarding the effect of geography on social violent behavior, this study introduces the idea that Geographic Fragmentation is associated with more terrorism, given its close relationship with the role of the government and socioeconomic conditions of people. We consider a panel of 128 countries between 1971 and 2005 using count data methodologies. This allows us to provide robust evidence for a consistent effect, even when different controls are included. Our baseline estimate indicates that one country with a 1% higher measure of Geographic Fragmentation is associated with an increment of 1.38 in the number of terrorist attacks on average.

JEL: C25, H56, D74

Keywords: determinants of terrorism, fragmentation, count data models, zero inflated models.

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I. Introduction

Terrorism is still a widespread phenomenon around the world that each year takes thousands of lives and generates economic and political damages. According to the Institute for Economics and Peace (2017), the economic costs of terrorism reached a maximum point of US $104 billion in 2010. Although the subsequent years experienced a decreasing trend, the costs remained as high as US $84 billion accounting just for injuries, property destruction and direct/indirect costs of deaths; here fatalities represented 81% of the total loss. Figure 1 helps to illustrate the current panorama, displaying the number of deaths explained by terrorism (in black) and the number of terrorist events (in gray). After 2010, a dramatic boost is shown for both series, while the gap between events and fatalities has also increased, suggesting that in the recent years we have witnessed more bloodthirsty terrorist attacks on average.

Since September 11, 2001, there has been growing interest in understanding the different determinants of terrorism across countries. Thenceforth, the media and the general public have been very receptive to research lines that remarked the importance of, first, political underdevelopment, and then, in subsequent studies, poor socio-economic conditions. Despite the exponential academic attention that this topic has attracted, the last years represent the largest increase in terrorism since 1970, in fact, there were fewer fatalities registered before 2001 than afterwards (1). This scenario evidences that further studies are required in order to achieve a deeper understanding and fight terrorism more effectively.

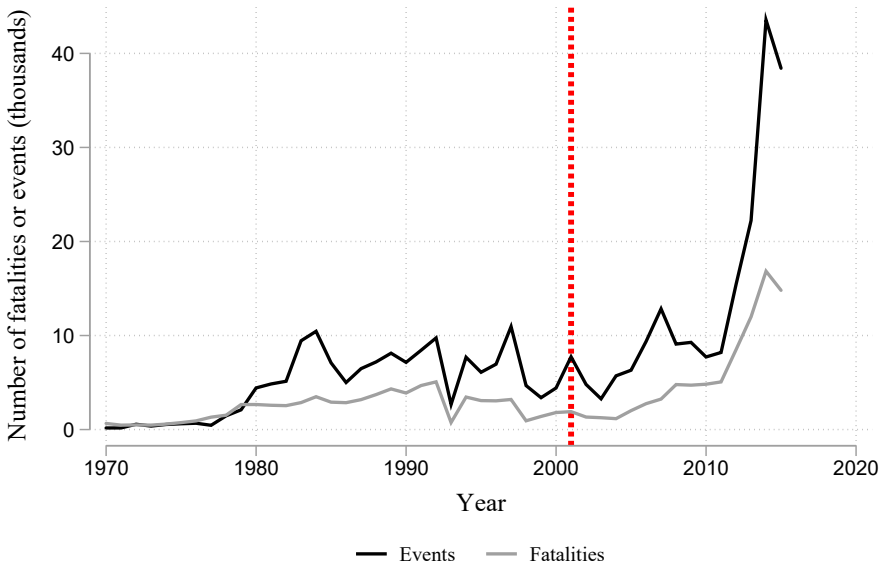


Figure 1: Number of fatalities caused by terrorist attacks from 1970 to 2015 using information from GTD.

Even if the immediate damage of a terrorist attacks is marginal, this phenomenon gradually results in substantial political and social costs (Abadie and Gardeazabal, 2003; Gupta et al., 2004; Crain and Crain, 2006; Gaibulloev and Sandler, 2008). More specifically, some of the consequences include a reduction in international trade (Nitsch and Schumacher, 2004), an increase in immigration issues (Dreher et al., 2011), a reduction in FDI (Enders and Sandler, 1996), a direct impact on many economic activities such as tourism (Enders et al., 1992), and of course, a decline in individual and collective life satisfaction (Frey et al., 2009).

This study presents evidence that geographical diversity, a reflection of differences in preferences, may increase frustration of the population with central governments in a context where socio-economic conditions are central. We postulate that geographical fragmentation is correlated with terrorist attacks. In particular, we argue that geographical fragmentation usually leads to a decreased government presence throughout national territories (Bandyopadhyay and Younas, 2011) which means poorer socio-economic and political conditions for settled communities, and ultimately, outlaw forces are encouraged to use the complexity of the territory to strengthen and increase their operational capabilities to work against the central government (this argument agrees with the socio-economic issue noted by Freytag et al., 2011), and then create a terrorist response to frustration as noted by Crenshaw (1981) and Krueger and Malečková (2003). In fact, Okafor and Piesse (2017) carried out recent research in which they measured how prone a country becomes to terrorism according to the fragility of the state (linked to its inability to manage power throughout the national territory). This phenomenon not only causes domestic but also transnational terrorism, as in the Colombian case where the group FARC operates from the Ecuadorian and Venezuelan territories (as evidenced by the operation that resulted in the death of Raul Reyes).

To capture these effects, this study uses the Geographic Fragmentation Index (GFI) implemented by Canavire-Bacarreza et al. (2016). The GFI is calculated considering the weighted average probability of finding two individuals in different geographical areas within one country. This index does not capture differences in the total area dimensions of countries, and with the aim of incorporating this information, the GFI will be used in interaction with the country land area as proposed by Canavire-Bacarreza et al. (2016).

We propose that geographic fragmentation is linked to the feeling of abandonment in the population and the division of citizens that in turn facilitate and motivate the operation of terrorist groups. As Canavire-Bacarreza et al. (2016) explain, geographic fragmentation can "split" a country and separate it from its government in the first place because it inhibits physical access and communication between different areas of the territory. In the second place, the more geographically diverse countries tend to evidence greater heterogeneity among their population, including their political preferences which makes it difficult to fully represent citizens and then execute political decisions that satisfy them[1]; in the words of Canavire-Bacarreza et al. (2016) "geographical frag-

[1]Although Canavire-Bacarreza et al. (2016) mainly focus on preferences for the provision of public

mentation is a dimension of social diversity and as such can play a pivotal role in the organization of politics and the economy."

Following the main thesis of this article, presenting that geographical fragmentation is an element that increases the number of terrorist attacks mainly because it hinders complete presence of the government throughout the national territory. We extend our analysis to consider interactions of the mentioned variable (GFI*area) with two other variables, in order to further explore the previous hypotheses and ensure the statistical significance of this political associated phenomenon. On the one hand, according to the review presented by Krieger and Meierrieks (2011) and specific arguments such as the one in Li (2005) (which will be explained in the following sections), the level of democracy represents, to some extent, the behavior of the government and the degree of political representation, and it is correlated with terrorism; therefore, the interaction of this index with our proposed variable will be presented. In fact, Abadie (2004) provides evidence that greater political freedom increases terrorist conduct, particularly in periods of transition from an authoritarian regime to a democratic one. On the other hand, according to the literature, an element that could capture the effect of a greater absence of the state is the level of political and fiscal decentralization in the country. In the literature, there are conflicting positions about federalism and its effect on terrorism but few empirical estimates; for this reason and following the approaches of Frey and Luechinger (2004) that support the inclusion of this variable, we assess the effect of federalism and its interactions with our proposed variable considering that there is even less literature that has evaluated federalism in a socio-economic context and its impact on the number of terrorist attacks.

With this study, we contribute to academic discussions related to the determinants of terrorism; first, providing support to the idea that terrorism depends on, at least in part, a set of variables that reflect the poor socio-economic environment of the communities with inhabitants that tend to start using weapons as a response thereto[2]. This part of the study is focused on the paper presented by Freytag et al. (2011), which approached these determinants based on the opportunity cost of terrorism and noted that factors that help increase the opportunity cost of terrorism (e.g., socio-economic growth) have the potential to significantly reduce the violent behaviors of communities.

Second, we provide empirical evidence of a positive association between geographical fragmentation and terrorist attacks by considering the socio-economic situations of 128 countries between 1971 and 2005. Following previous studies and according to the points mentioned above, we use a database reporting domestic and transnational terrorism. We found that geographical fragmentation makes terrorist behavior more attractive, and we show that its effect is consistent across methods by introducing

goods and services, they also refer to how culture and the different economic activities of each place, that are generally influenced by geography, affect preferences.

[2]To be more specific, these variables reflect, for instance, poor social welfare policies, economic discrimination and low levels of international commerce (Burgoon, 2006; Blomberg and Hess, 2008, 2005; Krieger and Meierrieks, 2010; Caruso and Schneider, 2011).

regional dummies and mainly temporal dummies depicting historical events that have caused significant increases in the number of terrorist attacks per year. Our findings on the geographical fragmentation variables support the literature that remarks the importance of total government presence throughout a national territory to increase the opportunity cost of violent behavior and the generation of illegitimate groups that use terrorism as a means to achieve their objectives. The paper is organized as follows: Section II reviews some relevant previous research on terrorism, from which we select our variables to control for socio-economic conditions. Section III presents the data collection and Section IV explains our methodology. Section V presents our findings and the respective analyses. Section VI finishes with our main conclusions.

II. Determinants of terrorism: a review

A generally accepted definition of terrorism is "the deliberate use of violence and intimidation directed at a small group of people to coerce a community (government) comprising demands [that are] political or ideologically motivated" (Krieger and Meierrieks, 2011). In the mainstream literature, terrorists' interests are usually divided into short and long-term interests; according to Tavares (2004), short-term interests include the following: 1) gaining publicity and media attention, 2) destabilizing the political system and 3) damaging the economic system. According to Frey and Luechinger (2004), long-term interests include seeking a redistribution of power, wealth and influence.

In line with the above, in economic studies, terrorists are treated as a rational subject, i.e., a terrorist behaves as a *homo economicus* (Caplan, 2006), which implies that terrorist acts are nothing but the attempt of individuals to maximize their profit by considering certain restrictions, costs, and benefits as they would do with any other economic decision (Sandler and Enders, 2004). Frey and Luechinger (2004) expound that the benefits of terrorism are derived by achieving the tactical and strategic objectives of each attack, and its costs are derived from the invested resources and opportunity costs of violent behavior.

II.I Commonly accepted hypothesis

In accordance with the points made by Krieger and Meierrieks (2011), the conditions of each country affect both the costs and benefits of terrorist behavior and therefore the level of attacks that occurs. In the economic literature, there are several schools of thought that have presented global assumptions about the main determinants of terrorism[3]. The first global hypothesis emphasizes the role of *economic deprivation*, that is, poverty and inequality between countries. Gurr (2015) presented the idea of "relative deprivation" in which an individual decides to become a terrorist after

[3]This does not imply that the global hypotheses contradict each other. Conversely, they complement each other and comprise a remarkable contribution to the literature.

comparing what he thinks he deserves with what he is already receiving through the distribution process of the economy. In other words, poor economic conditions create frustration with society, which leads to the generation of violent behavior.

Another global hypothesis is focused on what scholars have called the *modernization* process. Following Krieger and Meierrieks (2011), the modernization process involves economic change (accompanied by economic growth in some sectors and not in others), new forms of communication and lifestyles, and new social ideas. According to Robison et al. (2006), these factors can create grievances associated with socio-economic or demographic tensions. For example, the modernization process can create new jobs through certain economic activities as well as cause many that conduct more traditional activities to become jobless, and this can be translated into incentives to use weapons as an alternative instrument of achieving certain objectives. In other words, tensions occur during the process of changing from a traditional society to one that is modern (Ross, 1993). However, as highlighted by Krieger and Meierrieks (2011), these changes are difficult to capture in an empirical analysis and for this reason, some commonly accepted variables have been used, such as education level and population growth with respect to demographic changes.

Additionally, as remarked in the previous section, there is an important segment of the literature emphasizing that poor socio-economic conditions are determinants of terrorist conduct and are reflected in, for example, inadequate social welfare policies, economic discrimination and low levels of economic openness (Burgoon, 2006; Blomberg and Hess, 2008, 2005; Krieger and Meierrieks, 2010; Caruso and Schneider, 2011). Poor socio-economic conditions significantly reduce the opportunity cost of terrorism. Considering the above, this study considers variables commonly used to capture socio-economic conditions and adds a variable to capture the effect of geographic fragmentation on estimations.

The lack of *Political and institutional order* is also one of the globally accepted hypotheses in the literature regarding the causes of terrorism. According to Li (2005), democratic regimes can offer different, nonviolent methods for frustrated groups to express their ideas but are unable to develop a strong resistance to terrorism when it is already in operation because of its obligation to continue respecting certain civil liberties. However, there is no consensus regarding the political system that best reduces the likelihood of emerging terrorist acts. In any case, it is clear that how institutions are established in each country influences the cost-benefit calculation of potential terrorist agents. Bjørnskov et al. (2008) affirm that decentralization increases the well-being of individuals, and Frey and Luechinger (2004) emphasize that decentralized countries are more stable than centralized countries, in political and administrative terms. In fact, arguments are found in the literature that support the idea that federalist countries tend to be more efficient in governance and in the administration of security (Brennan and Buchanan, 1990; Tiebout, 1961); therefore, our research aims to present empirical evidence of the mentioned issue by using the classification of federal countries, as implemented by Treisman (2002), to determine the statistical effect on the number of

terrorist attacks when interacting with the GFI.

Instability and political transformation are also generally accepted as causes of terrorism because, as argued by Krieger and Meierrieks (2011), political instability creates gaps in which terrorist groups can take advantage because the opportunity cost of terrorism decreases. That is, instability and political transformation tend to amplify terrorist behavior. Furthermore, Huntington (1996) remarked that *civilizational clash* also generates terrorist acts. The author indicates that differences in religion or ethnicities can create disputes both within a country and between countries with different ideologies (such as the recent conflict between ISIS and the mainly Christian western countries). A religious determination can eliminate any moral restraint and contributes to the cohesion of terrorist organizations, which allows the development of the least expensive and most effective terrorist conduct (Bernholz, 2006).

The global economic and political order (globalization) is also one of the mostly commonly accepted determinants, as remarked by Krieger and Meierrieks (2011). Economic integration (measured by the level of market openness), foreign policy, and the alliances between countries can generate great discontent in a sizable segment of the population that, in the absence of alternatives, can take up arms as a sign of opposition (Bergesen and Lizardo, 2004). In fact, this phenomenon can lead to transnational terrorism when an ally of the government suffers from terrorist attacks by an insurgent group because of the support that this country grants to its ally (Addison and Murshed, 2005), and of course, terrorism also occurs to highlight two different ideologies between countries, as was reported in the Cold War (O'brien, 1996).

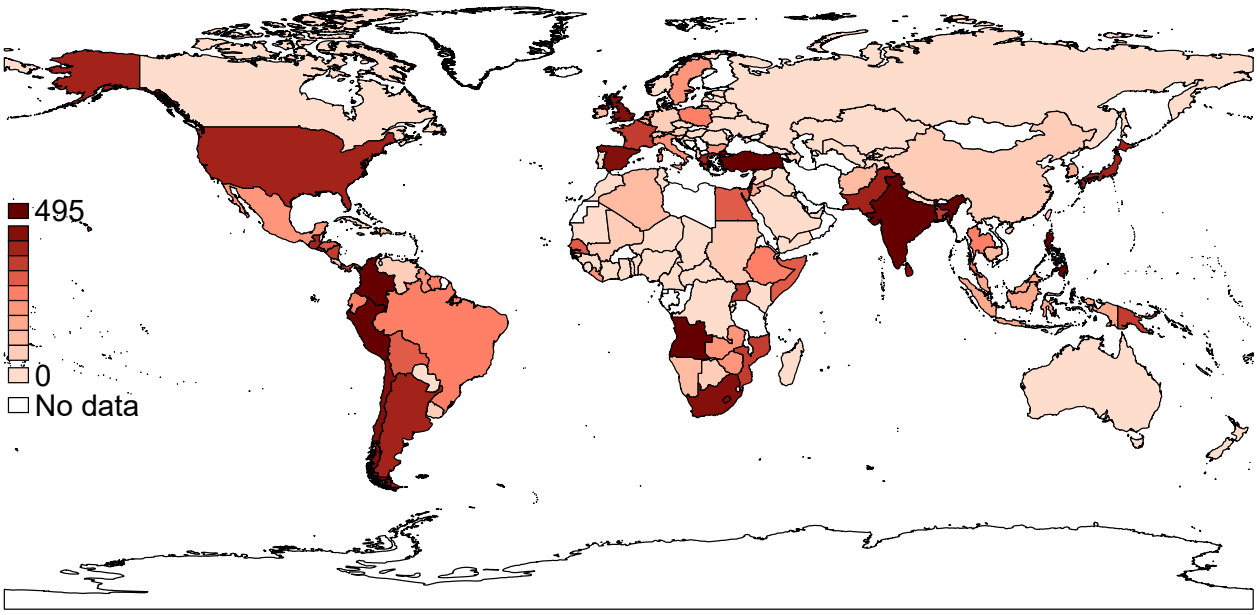
Finally, the global hypothesis that is closest to the central theme of this research is *contagion*. The main idea of this hypothesis is that terrorism is strengthened by time and space (Midlarsky et al., 1980). Many authors have submitted studies on temporal and geographical contagion, including Lai (2007), Plümper and Neumayer (2010), Blomberg and Hess (2008), Enders and Sandler (2005), and Piazza (2007). The theory of temporary contagion emphasizes that terrorist acts in the past may affect the present; for example, for organizations such as the FARC in Colombia, it is much more cost effective to carry out a terrorist campaign with continuous attacks (this campaign lasted for several decades). Spatial contagion, as defined by Krieger and Meierrieks (2011), means that if a country suffers from terrorism, it is likely to generate terrorism in its neighboring countries. However, the geographical position differs substantially from the hypothesis of our research in which we claim that the geographical fragmentation of each country reduces the opportunity cost of terrorist organizations because public preferences may be fragmented as well and the presence of the government throughout all the territory is harder to achieve, including its police or military forces. This represents a substantial opportunity for these groups to consolidate and strengthen.

III. Data

In this section, we specify the data used and the method to evaluate whether our hypothesis about geographical fragmentation has validity using features of the countries in terms of socio-economic conditions. According to Freytag et al. (2011), a legitimate assumption is that macroeconomic variables are correlated with terrorism, since the level of violence is not only related to individual considerations regarding opportunity costs but also to the support that communities provide to the individual terrorist (organization), which in turn depends on the socio-economic conditions[4].

Our dependent variable is the number of terrorist attacks (domestic and transnational) in a given country for each year. This variable was built with information from the *Global Terrorism Database* (LaFree and Dugan, 2007) collected for 128 countries between 1971 and 2005. It is important to clarify that the transnational terrorism is affected by international variables (Dreher and Gassebner, 2008; Savun and Phillips, 2009) and these variables affect domestic terrorism only to a small degree (e.g. Savun and Phillips, 2009). However, this study is an analysis based solely on the socio-economic framework following especially the proposals of Freytag et al. (2011).

Figure 2: Level of terrorist attacks in 1990 for the 128 countries available.



Source: Global Terrorism Database (2017).

We consider geography as two interacting dimensions: First, through a Geographic Fragmentation Index (GFI), previously developed by Canavire-Bacarreza et al. (2016)

[4]Bueno de Mesquita and Dickson (2007) presented a detailed study on popular support for terrorism.

and second, through country land area. The index reflects the weighted probability that two individuals, selected at random in the country, do not live in similar altitude zones, with the weight matrix calculated as the average distance between altitudes. Thus, the index is simply calculated as:

$$1 - \sum_{j=1}^{J} \sum_{i=1}^{N} (W_{ij} \frac{\eta_i}{N})^2, \tag{1}$$

Where $\frac{\eta_i}{N}$ is the share of population by elevation, and W_{ij} measures the distance between altitude i and altitude j. This measure goes from zero, which corresponds to the case where all the population is settled in the same altitude zone, to one that corresponds to the implausible case where each individual lives in a different altitude. In general, geographical fragmentation increases with the number of altitude zones and more equal weights between groups[5]. It can also be the case that geographical fragmentation is enhanced with country size and to allow for that, we interact the GFI with country land area. Figure 3 shows the geographical fragmentation index ranked from countries that are less fragmented (i.e., Belarus and Paraguay) to countries that show high levels of geographical fragmentation (i.e., Colombia, China, and Switzerland). We use the logged variable and avoid negative values by previously multiplying the GFI by 100 as presented in table 1.

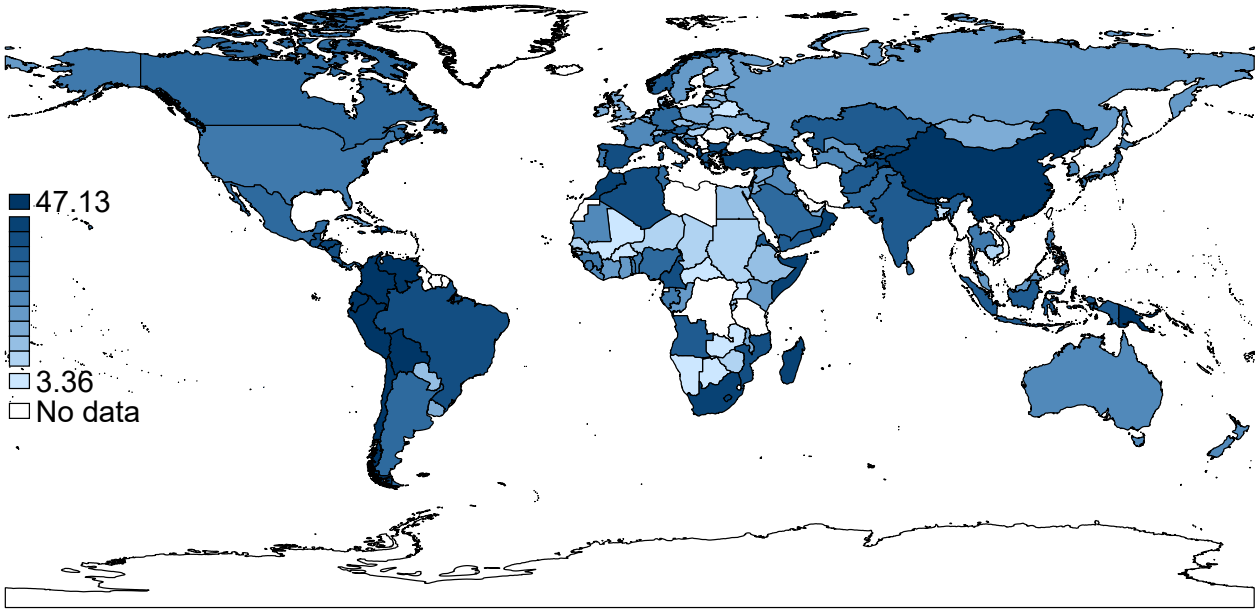
At this point, it is important to include regional identifiers. In figure 4, the GFI without its interaction with country land area, presents four outliers: two in America and two in Asia. To be more precise these outliers are Paraguay, Uruguay, Singapore and Bangladesh. However, according to figure 4, when the variable GFI interacts with country land area there is only one outlier (i.e Singapore), which considerably enhances the estimates and should be considered when analyzing the results.

Following Canavire-Bacarreza et al. (2016), the time invariance of geography presents a problem when using estimation methods that imply differencing of the data. In order to address this issue, we use several other estimation methods including conventional pooled OLS with regional and time specific dummy variables. Section IV further presents the most appropriate model for the data behavior, especially with respect of the dependent variable.

The main set of socio-economic variables is obtained from the *Penn World Table* (e.g. Summers and Heston, 1991). In alignment with Freytag et al. (2011), we included real GDP per capita and its square, since a higher per capita income tends to reflect a greater capacity of the state (e.g. Fearon and Laitin, 2003). What this implies is that a higher per capita income decreases the likelihood of open rebellion, but at the same time, according to Blomberg et al. (2004), it increases the likelihood of clandestine

[5]The methodology applied for the index is similar to the one applied by Gallup et al. (2003) for geography and that applied by Hudson (1972) for population.

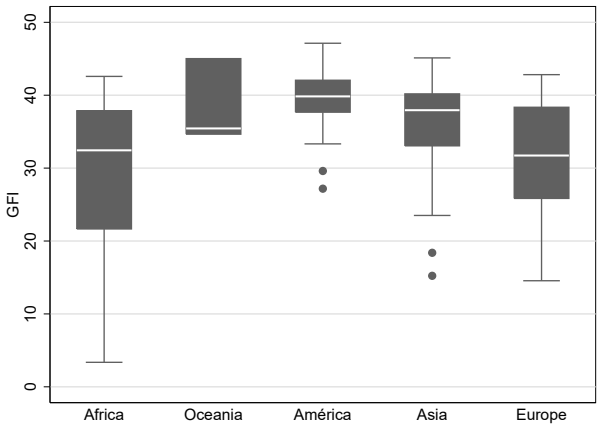
Figure 3: Map of the Geographical Fragmentation Index for the 128 countries available.



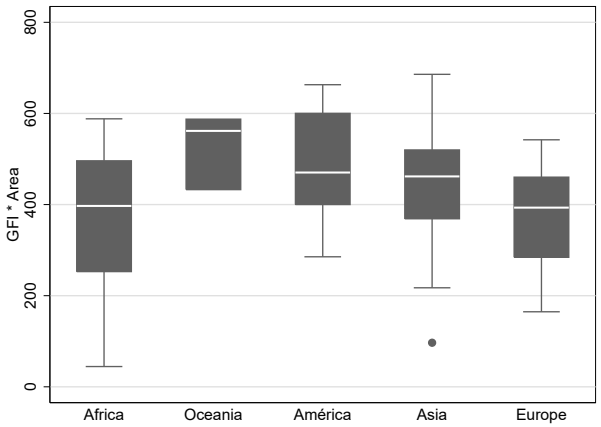
Source: Canavire-Bacarreza et al (2016).

Figure 4: Box plot for GFI and GFI*area by continental region.

(a) GFI



(b) GFI*area



activity. The relationship is non-linear; at the beginning, it is expected to have a positive effect on the possibility of clandestine activity, but later, it is expected to have a negative effect through a simple income effect related to the opportunity cost, as

mentioned above.

The aggregate level of consumption (as a percentage of GDP) is used because high levels of consumption represent better socio-economic conditions on the demand side (e.g. Headey et al., 2008). At the same time, the level of openness decreases the levels of terrorist attacks that are correlated with greater economic growth and improvements in the socio-political conditions (e.g. Levine and Renelt, 1992; Dollar and Kraay, 2004). In the same way, higher levels of investment (as a percentage of GDP) imply greater economic participation, economic growth and therefore, better socio-economic conditions (e.g. Levine and Renelt, 1992). Finally, according to Blomberg et al. (2004), in times of little economic growth, terrorist behavior tends to be more attractive because of its low opportunity cost; this is the reason we introduce the annual rate of economic growth.

Following Krieger and Meierrieks (2011) we use some non-economic variables as controls in the estimates following Krieger and Meierrieks (2011). The first of these is the level of democracy in the countries; according to this author, there is no consensus on the effect of democracy on the level of terrorist attacks, since, on the one hand, democracy offers higher levels of participation and legitimate channels to express grievances. On the other hand, democracy provides more liberties, which makes terrorist behavior less costly. In addition, Li (2005) argues that democracies tend to have institutions that limit the political and military actions of the government to directly suppress insurgent groups, which reduces the opportunity cost of these groups at the time of deciding to become terrorists. Therefore, this study uses the rate of political development *Polity2* (from the *POLITY IV project*); although, according to Freytag et al. (2011), the potential bias of this variable is assumed because the dependent variable is collected from the media, that is, democracies tend to put less restrictions on the dissemination of information than other social systems. With our data, there is a clear positive relationship between the level of democracy and terrorist attacks (figure 5), which is maximized by the geographical fragmentation of the countries, which gives us a first indication of the influence of the GFI on terrorist behavior. See appendix A.I for the confidence intervals and statistical significance associated with each interval.

Piazza (2008) found that political instability causes terrorist acts since for those groups outside the law, it is easier to attack new regimes that are not consolidated and do not have much support. In this case, the study used the number of years since the most recent change in a regime, which is also a variable for the *POLITY IV project* . Figure 6 presents this variable along with its interaction with GFI*area (logged). See appendix A.II for the confidence intervals and statistical significance associated with each interval.

According to Kirk (1983) the fact that a government is larger makes terrorist behavior attractive because it implies higher economic and political rents, which are generally the interests of these type of illegitimate groups. This study uses the size of the government (as a percentage of GDP) provided by the *Penn World Table*. Similarly, Krieger

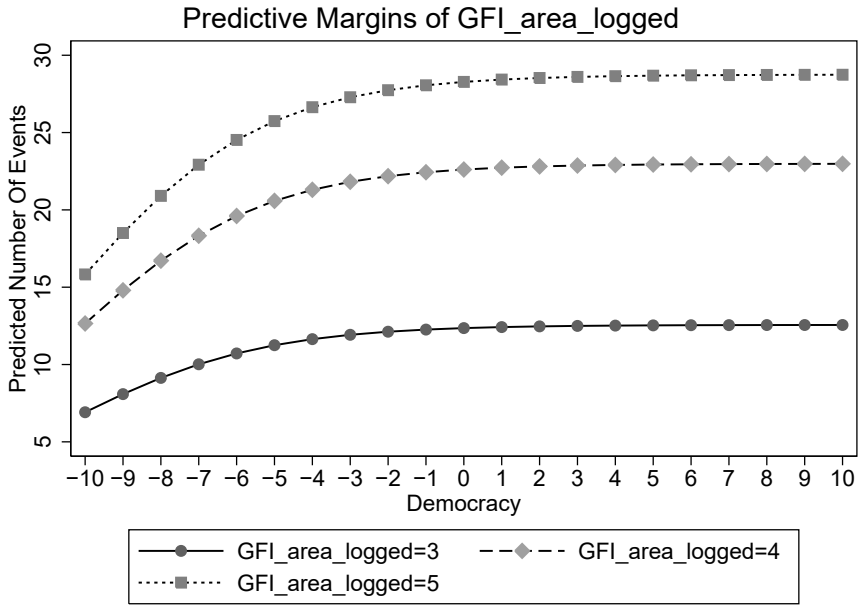
and Meierrieks (2011) argue that terrorist behavior is more likely in countries with larger populations because this means that due to demographic and ethnic tensions, it is more difficult for the government to enforce the law throughout the national territory. Thus, this study uses the population size that is provided by the *Penn World Table*. Finally, countries in times of civil war report much higher levels of terrorist attacks (see Merari, 1993). Therefore, this variable is expected to be statistically significant, especially its interaction with GFI, as shown in figure 7. For this variable, data are obtained from the *UCDP/PRIO Armed Conflict Dataset*. This will be a dummy variable, which takes the value of 1 if the internal conflict has at least 1000 victims per year. See appendix A.III for the confidence intervals and statistical significance associated with each interval, which are provided in figure 7.

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Total terrorist attacks	5220	14.69732	54.13488	0	710
Geographic Fragmentation Index (logged)	4608	3.456484	0.3797782	1.211915	3.852882
GFI*Area (logged)	4608	5.966781	0.4272635	3.794779	6.530587
Population (logged)	5220	9.010988	1.620574	4.491161	14.08272
Real GDP per capita (logged)	4831	8.499361	1.160437	5.033303	11.48908
Trade openness (logged)	4831	4.04888	0.7022133	0.082522	6.100463
Consumption (logged)	4831	4.123469	0.3672235	1.621194	5.530619
Government size (logged)	4831	2.796318	0.4828129	0.3631031	4.220289
Investment (logged)	4827	2.806613	0.7033434	-0.6996688	4.502944
Economic growth	4784	1.711539	7.704825	-65.02475	131.2425
Civil war	5220	0.0519157	0.2218781	0	1
Democracy	4631	0.6324768	7.435315	-10	10
Regime stability	4676	22.16681	28.86139	0	196
Federal	5220	0.1586207	0.365357	0	1

Note: See appendix A.VI for a list of countries in the study.

Figure 5: Margins plot of terrorist attacks by democracy and GFI*area (logged).



Note: discretized variable in a rank of five which goes from zero to the highest value of the variable.

Figure 6: Margins plot of terrorist attacks by regime stability and GFI*area (logged).

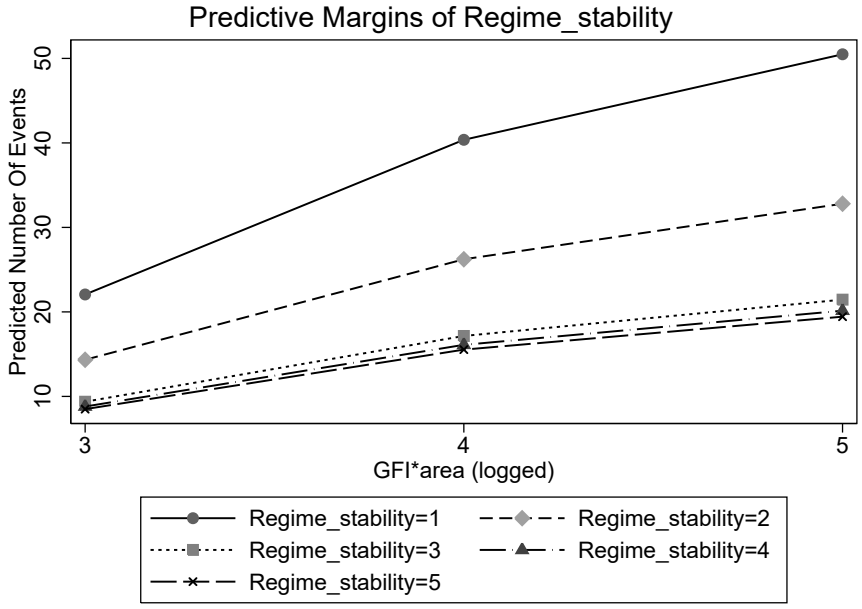
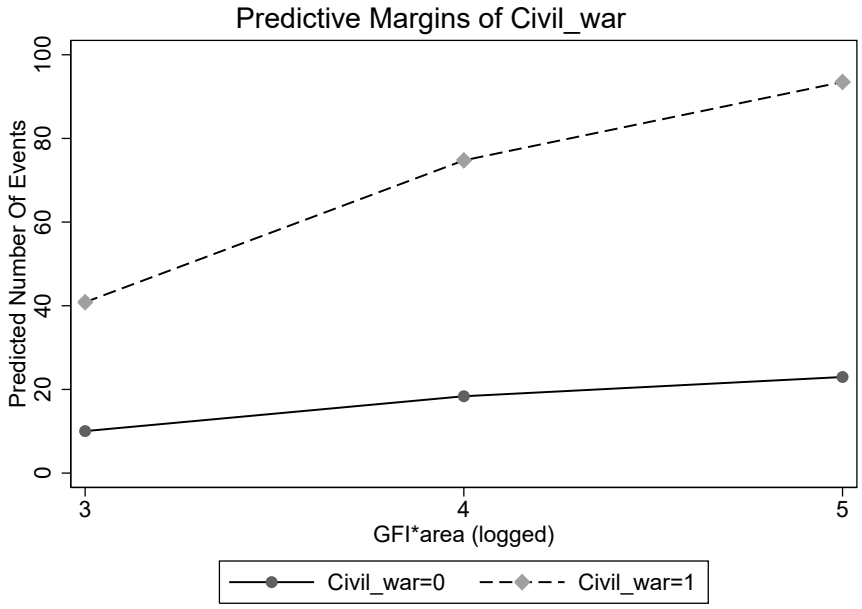


Figure 7: Margins plot of terrorist attacks by civil war and GFI*area (logged).



IV. Methods

When using a dependent count variable (the number of terrorist attacks by year and country), it is necessary to apply a regression method designed for this type of variable. Given the nature of the variable, there are two important aspects that need to be modeled: first, according to Freytag et al. (2011), the overdispersion feature allows us to use a negative binomial model instead of a type of Poisson model[6]. See appendix B.I which provides dispersion evidence related to the level of political development (democracy). As highlighted by Krieger and Meierrieks (2011), this type of model is a useful tool in the study of terrorism. Second, having a dependent variable that is highly inflated at zero makes it necessary to introduce a binary model that captures it. To a large degree, excess of zeros are model as an independent process and allows the negative binomial model to capture the determinants of the level of terrorist attacks. See appendix B.II for the histograms, which are evidence of a dependent variable that is highly inflated to zero.

The variable for the level of democracy (obtained from the *Polity IV project*) becomes crucial in the zero inflated negative binomial estimations because after applying the Voung test (Vuong, 1989) and analyzing the behavior that is reflected in figure 5, it is presented as the appropriate variable for the binary component of the model. In some models, regional and year dummies are included to capture heterogeneity and serial correlation. Future changes will be implemented in robustness checks, as noted in sections (V.II and V.III).

V. Empirical Results

V.I Main results

First, the preliminary results are presented in table 2 for OLS, which provide a preliminary overview of the effects generated by our geographical variables,the socio-economic variables and the additional controls that have been included. As noted in table 2, the preliminary results show the positive and significant effect of geographical fragmentation variables, for both GFI and GFI in interaction with the country land area (GFI*area), through the different additional controls (temporary and regional dummies). The socio-economic variables are in line with the findings of Freytag et al. (2011), which, in these early estimates by OLS, do not have the expected level of significance because the estimates do not model the dispersion or the high number of zeros that appear for our dependent variable. In addition, political variables, such as regime stability, show the expected direction of the effect. It is important to recognize that the civil war variable has a very large influence on terrorist attacks, a magnitude to consider in subsequent estimates.

[6]See Cameron and Trivedi (2013) for a more detailed description of this type of count data models.

Table 2: OLS estimations (preliminar approach).

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	OLS					
Real GDP per capita t-1 (logged)	98.26***	91.55***	84.77***	100.4***	92.17***	85.31***
	(11.12)	(10.49)	(10.07)	(11.20)	(10.56)	(10.13)
Real GDP per capita t-1 (sq,logged)	-5.494***	-5.119***	-4.772***	-5.605***	-5.159***	-4.808***
	(0.646)	(0.612)	(0.589)	(0.650)	(0.616)	(0.593)
Economic growth t-1	-0.212*	-0.216*	-0.110	-0.219*	-0.222*	-0.115
	(0.113)	(0.118)	(0.114)	(0.114)	(0.119)	(0.115)
Population t-1 (logged)	4.691***	3.986***	4.514***	4.592***	3.898***	4.373***
	(0.741)	(0.711)	(0.725)	(0.766)	(0.716)	(0.731)
Consumption t-1 (logged)	5.993**	9.146***	6.896**	5.975**	9.102***	6.912***
	(2.501)	(2.779)	(2.708)	(2.482)	(2.742)	(2.670)
Investment t-1 (logged)	-1.137	-0.811	-1.613	-1.031	-0.916	-1.700
	(1.049)	(1.117)	(1.162)	(1.045)	(1.117)	(1.163)
Government size t-1 (logged)	2.777*	2.981*	1.627	2.527*	2.605*	1.248
	(1.531)	(1.594)	(1.623)	(1.532)	(1.577)	(1.608)
Trade openness t-1 (logged)	-10.26***	-10.76***	-8.595***	-10.32***	-10.69***	-8.522***
	(1.263)	(1.220)	(1.174)	(1.254)	(1.219)	(1.173)
Regime stability t-1	-0.0255	0.0130	-0.00633	-0.0296	0.0115	-0.00776
	(0.0312)	(0.0350)	(0.0347)	(0.0315)	(0.0350)	(0.0347)
Democracy t-1	1.102***	1.215***	1.405***	1.104***	1.204***	1.395***
	(0.133)	(0.154)	(0.162)	(0.133)	(0.155)	(0.163)
Civil war	64.65***	65.24***	62.55***	64.74***	65.38***	62.67***
	(8.352)	(8.554)	(8.374)	(8.370)	(8.561)	(8.380)
GFI (logged)	8.643***	6.494***	6.512***			
	(1.370)	(1.351)	(1.376)			
GFI*Area (logged)				5.320***	3.874***	4.201***
				(1.490)	(1.484)	(1.521)
Constant	-478.3***	-451.7***	-428.2***	-488.4***	-453.4***	-431.4***
	(46.47)	(45.49)	(44.12)	(47.70)	(45.90)	(44.53)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	3,949	3,751	3,751	3,949	3,751	3,751
R-squared	0.165	0.173	0.201	0.163	0.172	0.200

Note: dependent variables is total terrorist attacks within a country per year. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

When analyzing table 3, as discussed earlier in the hypothesis section of this study, the results show a positive and significant effect (at the 1% level) between the geographical fragmentation variables and the number of terrorist attacks after zero inflation negative binomial estimates are presented. These results are consistent with models in which the GFI and country land area are used separately (models 1, 2, and 3), as well as in those that use the interaction between both variables (GFI*area). However, there is a change in the magnitude of the effects when the interaction is presented. Our most complete model (Column 6) indicates that an increase in 1% of our measure of Geographic Fragmentation is associated with an increment of 1.38 in the number of terrorist attacks on average[7]. The margins of table 4 indicate, with regard to the dis-

[7]This effect is calculated as $\exp(\beta_{GFI*Area}) = \exp(0.329)$.

Table 3: Zero-inflated negative binomial estimations.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ZINB					
Negative binomial						
Real GDP per capita(logged)	5.626***	3.918***	4.332***	5.957***	3.952***	4.405***
	(0.730)	(0.744)	(0.697)	(0.764)	(0.777)	(0.722)
Real GDP per capita (sq,logged)	-0.292***	-0.199***	-0.224***	-0.308***	-0.200***	-0.227***
	(0.0416)	(0.0430)	(0.0403)	(0.0437)	(0.0450)	(0.0418)
Economic growth	-0.0220***	-0.0218***	-0.0151***	-0.0229***	-0.0225***	-0.0159***
	(0.00630)	(0.00633)	(0.00524)	(0.00641)	(0.00641)	(0.00532)
Population(logged)	0.497***	0.557***	0.543***	0.470***	0.553***	0.538***
	(0.0367)	(0.0378)	(0.0387)	(0.0381)	(0.0403)	(0.0414)
Consumption(logged)	0.770***	0.417**	0.215	0.787***	0.342**	0.147
	(0.146)	(0.171)	(0.173)	(0.139)	(0.167)	(0.169)
Investment(logged)	-0.270***	-0.319***	-0.237***	-0.277***	-0.354***	-0.265***
	(0.0872)	(0.0957)	(0.0867)	(0.0858)	(0.0951)	(0.0844)
Government size(logged)	0.680***	0.707***	0.606***	0.698***	0.702***	0.594***
	(0.0997)	(0.0970)	(0.0911)	(0.100)	(0.0953)	(0.0897)
Trade openness(logged)	-0.765***	-0.712***	-0.859***	-0.781***	-0.728***	-0.875***
	(0.0686)	(0.0695)	(0.0705)	(0.0712)	(0.0701)	(0.0695)
Regime stability	-0.00763***	-0.00677***	-0.00416***	-0.00849***	-0.00749***	-0.00486***
	(0.00119)	(0.00129)	(0.00125)	(0.00122)	(0.00133)	(0.00127)
Civil war	1.574***	1.485***	1.465***	1.621***	1.517***	1.501***
	(0.120)	(0.122)	(0.121)	(0.122)	(0.124)	(0.122)
GFI (logged)	1.024***	0.728***	0.675***			
	(0.140)	(0.147)	(0.138)			
GFI * Area (logged)				0.645***	0.380***	0.329***
				(0.119)	(0.131)	(0.123)
Constant	-33.53***	-24.50***	-26.19***	-35.21***	-24.03***	-25.84***
	(3.042)	(3.080)	(2.902)	(3.107)	(3.212)	(2.980)
Inflate						
Democracy	-0.348***	-0.381***	-0.395***	-0.350***	-0.385***	-0.398***
	(0.0244)	(0.0289)	(0.0293)	(0.0245)	(0.0293)	(0.0299)
Constant	-3.344***	-3.648***	-3.887***	-3.375***	-3.706***	-3.952***
	(0.184)	(0.222)	(0.231)	(0.185)	(0.226)	(0.236)
α	1.211***	1.184***	1.050***	1.233***	1.200***	1.066***
	(0.0323)	(0.0324)	(0.0331)	(0.0324)	(0.0325)	(0.0330)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869

Note: Dependent variable is total terrorist attacks within a country per year. α indicates the overdispersion parameter of the negative binomial type II distribution. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

cretized variable GFI[8], a growing positive relationship, with the exception of the fourth level. This may be mainly due to the outliers or the omission of an effect associated with the country land area. This is captured later in the variable GFI*area (as well as in the discretized variable for GFI*area) and the margins presented in table 4 show a

[8]See the note in table 4 for a further description.

positive relationship that starts growing at the first level (beginning at the third). This is aligned with the results presented by Canavire-Bacarreza et al. (2016) in their study on decentralization.

Table 4: Margins for GFI and GFI*area.

GFI (logged)	Margin	[95% Conf.	Interval]	GFI*area (logged)	Margin	[95% Conf.	Interval]
1				1			
2	11.506**	1.508	21.503	2			
	(5.101)						
3	30.802**	4.639	56.965	3	11.944**	1.523	22.365
	(13.349)				(5.317)		
4	17.341***	12.043	22.639	4	21.855***	13.462	30.248
	(2.703)				(4.282)		
5	27.473***	23.475	31.471	5	27.333***	23.282	31.384
	(2.040)				(2.067)		

Note: Discretized variable in a rank of five which goes from zero to the highest value of the variable. Margins at means. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

The objective of this study is not to further analyze the socio-economic conditions and other variables used as controls, but it is worth noting that the effects of the variables align with the results presented previously in the literature, except those on consumption, which has the opposite effect. The results for investment and trade openness correspond to what is reported by Freytag et al. (2011), Blomberg and Hess (2008) and Kurrild-Klitgaard et al. (2006). The non-linear effect of the GDP per capita coincides with Lai (2007). The political variables included (democracy, regime stability and civil war) show results similar to the different studies reported in Krieger and Meierrieks (2011). Population, as a demographic determinant, also supports authors such as Burgoon (2006) and Lai (2007). Finally, the effects of larger government confirm what is found by Kirk (1983). In summary, the results for these variables, in terms of socio-economic conditions, appear in a range that aligns with the study conducted by Freytag et al. (2011).

V.II Robustness checks

In this section, we provide the results of the estimates with a temporal cluster variance, that is, a cluster variance for each year from 1971 to 2005. We use this method, since the twentieth century was marked by stages in which certain countries suffered many terrorist attacks due to political and ideological differences. For example, the decade of the 80s has statistical significance in the estimates, at the 1% level, mainly because nations were involved in international conflicts related to the Cold War, and different geopolitical disputes occurred during that time. In table C.II, estimates are presented without very significant changes in the results, which aligns with the intuition previously noted in results.

In addition, according to the arguments mentioned in the previous sections with respect to the mechanism of transmission regarding geographical fragmentation and the number of terrorist attacks per year, that is, geographical fragmentation prevents total government presence throughout the national territory, and we performed a robustness check interacting our proposed variable (GFI*area) with the level of democracy. Because the index from the *Polity IV project* includes values between -10 and 10, we rescale the index to facilitate interpretation. In addition, since the variable for democracy is discrete, the inclusion of it as a separate regressor generates strong problems of collinearity; therefore, it is not included in the estimates. Table 5 shows the consistency of the estimates, for both the variable previously used and the new interacted variable; the latter introduces a coefficient that is considerably smaller but significant at the 1% level. This is accompanied by a very interesting phenomenon, which, to a point, is in line with Abadie (2004); terrorist attacks increase in periods of transition toward a democracy. As a contribution of this research, this phenomenon is bigger for countries with higher geographic fragmentation. This is shown in figure 8. See appendix A.IV for the confidence intervals and statistical significance associated with each interaction.

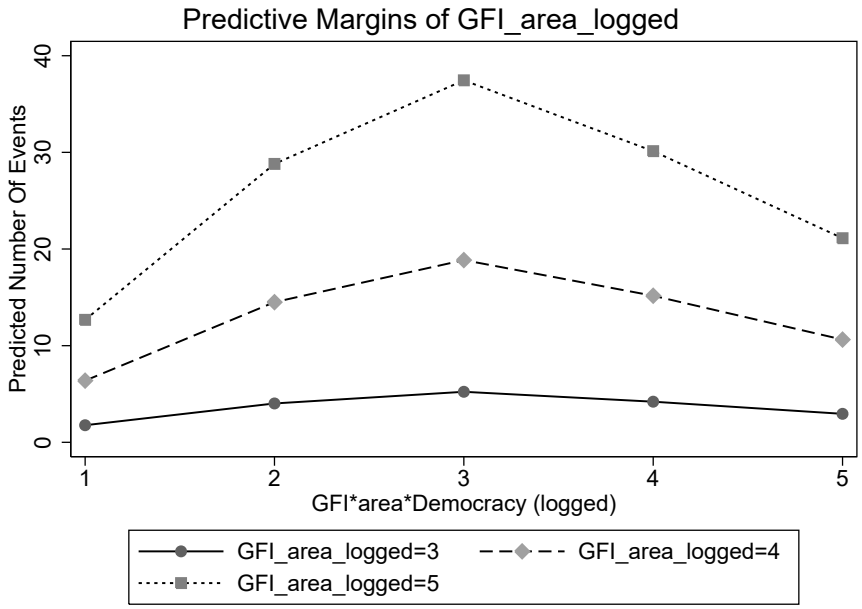
V.III Further robustness checks

One criticism of this study may be that the level of democracy (or of political freedom) of the countries does not fully capture a partial absence of the government in the national territory. To do this, a measure for greater decentralization seems to be a good alternative, according to the contributions of Frey and Luechinger (2004), Brennan and Buchanan (1990) and Tiebout (1961), which stress that decentralized countries are more stable than centralized countries in political and administrative terms. We incorporate a dummy taken from Treisman (2002) that records countries that have federal systems and adds Micronesia and Papua New Guinea. Figure 9 displays the negative effect of this variable on the number of terrorist attacks for countries with federal governments. This study presents new evidence of this effect by controlling for socio-economic conditions, the marginal effects presented in figure 9 have significance at the 5% and 1% levels, as shown in appendix A.V. We include this variable as a control and although the negative coefficient is significant at the 1% level, we include in addition to the estimation, this dummy in interaction with the GFI index (table 7 presents the results).The aim of analyzing this interaction is to assess whether the negative effect of decentralization remains for federal countries even when considering the positive effect of the variables on geographical fragmentation. The results are consistent and show positive effects for individual variables about geographical fragmentation and a negative effect for this interaction, but with a considerably lower coefficient in comparison to the last estimation where the federal dummy was introduced as an additional control (seventh estimation). The marginal effect of the GFI shows that the positive effect on terrorism is ameliorated in federalist countries, which supports the hypothesis that geographic fragmentation is associated with government abandonment.

From another perspective, the literature has assessed other types of fragmentation, such as ethnic, religious and linguistic. It is important to present evidence that the variable implemented for geographical fragmentation does not capture these other types of fragmentation in the estimates. For this reason, following Alesina et al. (2003), we include variables that the authors propose to assess these effects. Table 6 presents Spearman's non-parametric correlation considering the distributions of these variables. Subsequently, we include these elements and followed the same methodology presented in section V.I, consistent results were found. In fact, the variable of most interest (GFI*area) has a higher coefficient regarding the number of terrorist attacks across countries in the third estimation, where all types of fractionalization are included, as is shown in appendix C.I.

Finally, the last robustness check is based on Abadie (2004) who presented that two additional geographical variables, average elevation and fraction of the country area in tropical climate, are statistically related to terrorism behavior. Similarly, column 5 and 6 of table C.I control for these variables (taken from Gallup et al. 2010) and the effect of geographical fragmentation remains authentic[9].

Figure 8: Margins plot of terrorist attacks by GFI*area(logged) and the interaction of this variable with level of democracy.



[9]Note: The dataset (Gallup et al., 2010) does not have data for Tanzania, Trinidad and Tobago, Singapore and Belarus, which is the reason why the magnitude and the significance of the coefficient falls on columns 5 and 6 of table C.I.

Table 5: Robustness check using the interaction between GFI*Area and level of democracy.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ZINB					
Negative binomial						
Real GDP per capita(logged)	5.688***	3.961***	4.287***	5.997***	4.001***	4.361***
	(0.707)	(0.710)	(0.670)	(0.743)	(0.741)	(0.695)
Real GDP per capita (sq,logged)	-0.299***	-0.203***	-0.223***	-0.314***	-0.204***	-0.226***
	(0.0401)	(0.0410)	(0.0387)	(0.0423)	(0.0429)	(0.0401)
Economic growth	-0.0219***	-0.0218***	-0.0149***	-0.0228***	-0.0225***	-0.0156***
	(0.00630)	(0.00634)	(0.00521)	(0.00641)	(0.00642)	(0.00529)
Population(logged)	0.475***	0.535***	0.530***	0.447***	0.530***	0.524***
	(0.0362)	(0.0382)	(0.0388)	(0.0377)	(0.0409)	(0.0417)
Consumption(logged)	0.622***	0.317*	0.115	0.628***	0.252	0.0575
	(0.172)	(0.182)	(0.178)	(0.166)	(0.175)	(0.173)
Investment(logged)	-0.320***	-0.351***	-0.260***	-0.331***	-0.381***	-0.284***
	(0.0909)	(0.0978)	(0.0867)	(0.0891)	(0.0973)	(0.0846)
Government size(logged)	0.637***	0.663***	0.571***	0.652***	0.659***	0.558***
	(0.101)	(0.0990)	(0.0914)	(0.101)	(0.0974)	(0.0903)
Trade openness(logged)	-0.740***	-0.692***	-0.837***	-0.752***	-0.706***	-0.851***
	(0.0696)	(0.0688)	(0.0702)	(0.0723)	(0.0696)	(0.0694)
Regime stability	-0.00817***	-0.00716***	-0.00465***	-0.00912***	-0.00789***	-0.00537***
	(0.00117)	(0.00126)	(0.00125)	(0.00120)	(0.00130)	(0.00126)
Civil war	1.609***	1.514***	1.493***	1.659***	1.547***	1.531***
	(0.123)	(0.126)	(0.124)	(0.125)	(0.128)	(0.125)
GFI (logged)	0.916***	0.628***	0.589***			
	(0.148)	(0.150)	(0.141)			
GFI * Area (logged)				0.575***	0.324**	0.285**
				(0.127)	(0.134)	(0.124)
GFI (logged)*Democracy	0.00742**	0.00812**	0.00740***			
	(0.00304)	(0.00323)	(0.00267)			
(GFI * Area, logged)*Democracy				0.00481***	0.00483**	0.00443***
				(0.00180)	(0.00189)	(0.00157)
Constant	-32.53***	-23.77***	-25.19***	-34.02***	-23.39***	-24.92***
	(3.088)	(3.035)	(2.861)	(3.165)	(3.142)	(2.927)
Inflate						
Democracy	-0.346***	-0.380***	-0.394***	-0.347***	-0.383***	-0.398***
	(0.0255)	(0.0303)	(0.0307)	(0.0257)	(0.0309)	(0.0314)
Constant	-0.0368	-0.0207	-0.109	-0.0775	-0.0501	-0.151
	(0.193)	(0.207)	(0.218)	(0.200)	(0.212)	(0.224)
α	1.231***	1.204***	1.067***	1.255***	1.219***	1.083***
	(0.0323)	(0.0326)	(0.0339)	(0.0326)	(0.0327)	(0.0338)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869

Note: Dependent variable is total terrorist attacks per year. α indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; *** p<0.01, **p<0.05, *p<0.1.

Figure 9: Margins plot of terrorist attacks by a dummy for federalism and GFI*area (logged).

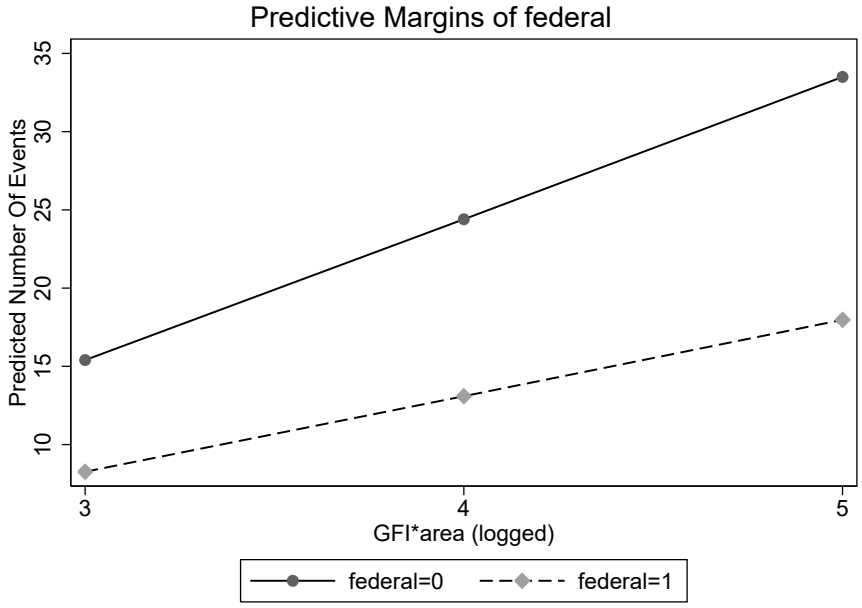


Table 6: Non-parametric correlation between fragmentation variables.

Variable	GFI	GFI*area
GFI	1	
GFI*area	0.8531*	1
Ethnic Frac.	-0.0078	0.0808*
Language Frac.	-0.2406*	-0.1301*
Religion Frac.	-0.2368*	-0.2391*

Note: Spearman's correlation implemented. * p< 0.01.

Table 7: Robustness check using the interaction between GFI*area and a dummy for federalism.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ZINB						
Negative binomial							
Real GDP per capita(logged)	5.027***	3.454***	3.640***	5.320***	3.480***	3.689***	3.699***
	(0.733)	(0.731)	(0.672)	(0.769)	(0.764)	(0.696)	(0.696)
Real GDP per capita (sq,logged)	-0.256***	-0.169***	-0.180***	-0.269***	-0.170***	-0.182***	-0.183***
	(0.0419)	(0.0424)	(0.0389)	(0.0440)	(0.0444)	(0.0404)	(0.0404)
Economic growth	-0.0222***	-0.0220***	-0.0149***	-0.0231***	-0.0227***	-0.0156***	-0.0156***
	(0.00627)	(0.00631)	(0.00516)	(0.00638)	(0.00640)	(0.00525)	(0.00524)
Population(logged)	0.555***	0.610***	0.615***	0.527***	0.604***	0.609***	0.603***
	(0.0376)	(0.0391)	(0.0411)	(0.0388)	(0.0415)	(0.0435)	(0.0433)
Consumption(logged)	0.764***	0.442**	0.215	0.790***	0.378**	0.163	0.159
	(0.147)	(0.173)	(0.171)	(0.137)	(0.167)	(0.165)	(0.165)
Investment(logged)	-0.241***	-0.310***	-0.227***	-0.251***	-0.348***	-0.257***	-0.256***
	(0.0868)	(0.0963)	(0.0863)	(0.0852)	(0.0956)	(0.0839)	(0.0839)
Government size(logged)	0.647***	0.678***	0.575***	0.661***	0.673***	0.561***	0.553***
	(0.0989)	(0.0982)	(0.0900)	(0.0985)	(0.0962)	(0.0883)	(0.0884)
Trade openness(logged)	-0.778***	-0.714***	-0.849***	-0.788***	-0.727***	-0.862***	-0.860***
	(0.0685)	(0.0695)	(0.0711)	(0.0709)	(0.0697)	(0.0696)	(0.0696)
Regime stability	-0.00730***	-0.00709***	-0.00469***	-0.00806***	-0.00773***	-0.00530***	-0.00521***
	(0.00114)	(0.00127)	(0.00121)	(0.00117)	(0.00131)	(0.00123)	(0.00123)
Civil war	1.541***	1.482***	1.451***	1.583***	1.515***	1.489***	1.493***
	(0.117)	(0.118)	(0.117)	(0.120)	(0.119)	(0.117)	(0.117)
GFI (logged)	1.065***	0.762***	0.706***				
	(0.149)	(0.155)	(0.144)				
GFI * Area (logged)				0.705***	0.422***	0.376***	0.373***
				(0.123)	(0.136)	(0.126)	(0.126)
Federal							-0.592***
							(0.101)
GFI (logged)*Federal	-0.183***	-0.151***	-0.165***				
	(0.0275)	(0.0286)	(0.0280)				
(GFI * Area, logged)*Federal				-0.111***	-0.0899***	-0.0980***	
				(0.0165)	(0.0169)	(0.0165)	
Constant	-31.64***	-23.30***	-23.99***	-33.41***	-22.97***	-23.76***	-23.70***
	(3.043)	(3.024)	(2.772)	(3.113)	(3.156)	(2.855)	(2.855)
Inflate							
Democracy	-0.346***	-0.378***	-0.392***	-0.348***	-0.382***	-0.395***	-0.395***
	(0.0239)	(0.0285)	(0.0288)	(0.0240)	(0.0289)	(0.0293)	(0.0293)
Constant	0.182	0.181	0.102	0.170	0.161	0.0736	0.0727
	(0.147)	(0.159)	(0.170)	(0.149)	(0.161)	(0.174)	(0.174)
α	1.185***	1.168***	1.027***	1.207***	1.183***	1.043***	1.044***
	(0.0324)	(0.0327)	(0.0328)	(0.0324)	(0.0326)	(0.0326)	(0.0326)
Regional dummies	NO	YES	YES	NO	YES	YES	YES
Time effects	NO	NO	YES	NO	NO	YES	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869	3,869

Note: Dependent variable is total terrorist attacks per year. α indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; *** p<0.01, **p<0.05, *p<0.1.

VI. Conclusions

This research makes a contribution to the literature related to the determinants of terrorism by introducing variables, such as geographical fragmentation, to a background of socio-economic conditions. According to the estimates, the study succeeds in showing a positive effect of the Geographical Fragmentation Index (GFI) and its interaction with country land area (GFI*area). When analyzing the margins, it is clear that the interacted variable has a steadily growing effect at all levels (statistically significant); margins that are calculated leaving the other variables in their average level. This effect is consistent across the different estimates and robustness checks.

Even the interaction between the proposed variable (GFI) and the others that have a political nature, such as the level of democracy and political decentralization, presents statistically significant results that support our hypothesis. Namely, geographical fragmentation generates heterogeneous preferences and hinders the government's presence throughout the national territory, which leads to a worsening in the socio-economic conditions; therefore, it acts as an incentive for terrorist behavior considering that their opportunity cost is lower when faced with a fragile state (in alignment with the findings in Crenshaw, 1981; Krueger and Malečková, 2003; Okafor and Piesse, 2017).

It is important to note that this investigation also serves as a support to what has already been presented by authors, such as Freytag et al. (2011), Blomberg and Hess (2008), Kurrild-Klitgaard et al. (2006) and Lai (2007), who have studied the determinants of terrorism from the socio-economic perspective. Finally, this study also shows the particular effect that democracy and government size have on terrorist behavior (as an extension of what is presented in Li, 2005; Kirk, 1983).

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A. Appendix: Predictive Margins

A.I Statistical significance and confidence intervals for margins by level of democracy and GFI*area (logged) (figure 5)

Level interaction		Margin	Std. Err.	P-value	[95% Conf.	Interval]	Level interaction		Margin	Std. Err.	P-value	[95% Conf.	Interval]
Democracy	GFI*area (logged)						Democracy	GFI*area (logged)					
1	3	6.916	3.192	0.030	0.660	13.171	11	4	22.610	4.418	0.000	13.952	31.269
1	4	12.654	2.769	0.000	7.227	18.082	11	5	28.277	2.132	0.000	24.098	32.456
1	5	15.826	1.807	0.000	12.283	19.368	12	3	12.422	5.518	0.024	1.607	23.238
2	3	8.087	3.683	0.028	0.869	15.305	12	4	22.730	4.439	0.000	14.029	31.431
2	4	14.798	3.095	0.000	8.733	20.863	12	5	28.428	2.142	0.000	24.230	32.625
2	5	18.507	1.798	0.000	14.982	22.031	13	3	12.467	5.537	0.024	1.614	23.321
3	3	9.136	4.124	0.027	1.054	17.219	13	4	22.813	4.454	0.000	14.083	31.543
3	4	16.717	3.398	0.000	10.056	23.378	13	5	28.531	2.148	0.000	24.320	32.741
3	5	20.907	1.813	0.000	17.354	24.460	14	3	12.498	5.551	0.024	1.619	23.377
4	3	10.017	4.496	0.026	1.205	18.828	14	4	22.869	4.464	0.000	14.119	31.619
4	4	18.328	3.665	0.000	11.144	25.512	14	5	28.601	2.153	0.000	24.381	32.820
4	5	22.922	1.858	0.000	19.281	26.563	15	3	12.519	5.560	0.024	1.622	23.416
5	3	10.717	4.792	0.025	1.324	20.109	15	4	22.907	4.471	0.000	14.143	31.670
5	4	19.609	3.885	0.000	11.995	27.223	15	5	28.648	2.156	0.000	24.423	32.874
5	5	24.524	1.919	0.000	20.763	28.284	16	3	12.533	5.566	0.024	1.625	23.442
6	3	11.249	5.018	0.025	1.414	21.085	16	4	22.933	4.476	0.000	14.160	31.706
6	4	20.584	4.056	0.000	12.635	28.533	16	5	28.681	2.158	0.000	24.452	32.910
6	5	25.743	1.979	0.000	21.864	29.622	17	3	12.543	5.570	0.024	1.626	23.459
7	3	11.642	5.185	0.025	1.479	21.804	17	4	22.951	4.479	0.000	14.172	31.729
7	4	21.302	4.183	0.000	13.103	29.500	17	5	28.703	2.159	0.000	24.471	32.935
7	5	26.641	2.030	0.000	22.662	30.620	18	3	12.549	5.573	0.024	1.627	23.472
8	3	11.923	5.305	0.025	1.526	22.321	18	4	22.963	4.481	0.000	14.179	31.746
8	4	21.817	4.275	0.000	13.438	30.197	18	5	28.718	2.160	0.000	24.484	32.951
8	5	27.286	2.069	0.000	23.230	31.342	19	3	12.554	5.575	0.024	1.628	23.480
9	3	12.122	5.390	0.025	1.558	22.686	19	4	22.971	4.483	0.000	14.185	31.757
9	4	22.181	4.340	0.000	13.674	30.688	19	5	28.728	2.161	0.000	24.493	32.963
9	5	27.741	2.098	0.000	23.629	31.853	20	3	12.557	5.576	0.024	1.628	23.485
10	3	12.261	5.449	0.024	1.581	22.941	20	4	22.976	4.484	0.000	14.188	31.764
10	4	22.435	4.386	0.000	13.838	31.031	20	5	28.735	2.161	0.000	24.500	32.970
10	5	28.058	2.118	0.000	23.907	32.209	21	3	12.559	5.577	0.024	1.628	23.489
11	3	12.357	5.490	0.024	1.597	23.117	21	4	22.980	4.484	0.000	14.191	31.769
							21	5	28.740	2.161	0.000	24.504	32.975

A.II Statistical significance and confidence intervals for margins by GFI*area (logged) and regime stability (figure 6)

Level interaction		Margin	Std. Err.	P-value	[95% Conf.	Interval]
GFI*area (logged)	Regime stability					
3	1	22.063	10.141	0.030	2.188	41.938
3	2	14.335	6.607	0.030	1.386	27.285
3	3	9.375	4.281	0.029	0.984	17.765
3	4	8.801	3.891	0.024	1.175	16.428
3	5	8.493	3.810	0.026	1.025	15.960
4	1	40.371	8.532	0.000	23.649	57.093
4	2	26.231	5.617	0.000	15.221	37.240
4	3	17.154	3.793	0.000	9.719	24.588
4	4	16.105	3.444	0.000	9.355	22.855
4	5	15.539	3.276	0.000	9.118	21.961
5	1	50.490	5.497	0.000	39.716	61.263
5	2	32.805	4.113	0.000	24.744	40.866
5	3	21.453	2.347	0.000	16.854	26.052
5	4	20.141	2.397	0.000	15.444	24.839
5	5	19.434	2.109	0.000	15.300	23.568

A.III Statistical significance and confidence intervals for margins by GFI*area (logged) and civil war (figure 7)

Level interaction		Margin	Std. Err.	P-value	[95% Conf.	Interval]
GFI*area (logged)	Civil war					
3	0	10.039	4.473	0.025	1.273	18.805
3	1	40.857	18.813	0.030	3.985	77.729
4	0	18.369	3.642	0.000	11.231	25.507
4	1	74.760	16.052	0.000	43.298	106.221
5	0	22.973	1.885	0.000	19.279	26.667
5	1	93.498	10.638	0.000	72.648	114.348

A.IV Statistical significance and confidence intervals for margins by (GFI*area,logged)*democracy through all levels of (GFI*area,logged) (figure 8)

Level interaction		Margin	Std. Err.	P-value	[95% Conf.	Interval]
Democracy* (GFI*area,logged)	GFI*area (logged)					
1	3	1.769	0.879	0.044	0.046	3.492
1	4	6.380	1.687	0.000	3.074	9.686
1	5	12.674	2.093	0.000	8.573	16.776
2	3	4.021	2.015	0.046	0.072	7.969
2	4	14.501	3.553	0.000	7.538	21.464
2	5	28.806	5.627	0.000	17.778	39.834
3	3	5.228	2.295	0.023	0.731	9.725
3	4	18.855	4.851	0.000	9.348	28.363
3	5	37.457	6.473	0.000	24.770	50.144
4	3	4.205	2.034	0.039	0.219	8.191
4	4	15.165	3.523	0.000	8.260	22.070
4	5	30.127	4.000	0.000	22.286	37.967
5	3	2.948	1.388	0.034	0.228	5.667
5	4	10.631	2.583	0.000	5.569	15.692
5	5	21.118	1.620	0.000	17.943	24.294

A.V Statistical significance and confidence intervals for margins by GFI*area (logged) and a dummy for federalism (figure 9)

Level interaction		Margin	Std. Err.	P-value	[95% Conf.	Interval]
GFI*area (logged)	Federalism					
3	1	15.402	6.844	0.024	1.987	28.816
3	0	8.264	3.655	0.024	1.100	15.428
4	1	24.400	4.953	0.000	14.693	34.107
4	0	13.093	2.906	0.000	7.398	18.788
5	1	33.498	3.048	0.000	27.523	39.472
5	0	17.974	1.569	0.000	14.899	21.049

A.VI List of countries

Afghanistan	Croatia	Israel	Namibia	Sri Lanka
Albania	Cuba	Italy	Nepal	Sudan
Algeria	Czech Republic	Ivory Coast	Netherlands	Sweden
Angola	Denmark	Jamaica	New Zealand	Switzerland
Argentina	Dominican Republic	Japan	Nicaragua	Syria
Australia	Ecuador	Jordan	Niger	Tajikistan
Austria	Egypt	Kazakhstan	Nigeria	Tanzania
Azerbaijan	El Salvador	Kenya	Norway	Thailand
Bangladesh	Estonia	Kuwait	Pakistan	Togo
Belarus	Ethiopia	Kyrgyzstan	Panama	Trinidad and Tobago
Belgium	France	Laos	Papua New Guinea	Tunisia
Benin	Georgia	Latvia	Paraguay	Turkey
Bolivia	Germany	Lebanon	Peru	Uganda
Botswana	Ghana	Lesotho	Philippines	Ukraine
Brazil	Greece	Liberia	Poland	United Arab Emirates
Bulgaria	Guatemala	Libya	Portugal	United Kingdom
Burundi	Guinea	Lithuania	Russia	United States
Cambodia	Guinea-Bissau	Macedonia	Rwanda	Uruguay
Cameroon	Haiti	Madagascar	Saudi Arabia	Uzbekistan
Canada	Honduras	Malaysia	Senegal	Venezuela
Central African Republic	Hungary	Mali	Sierra Leone	Vietnam
Chad	India	Mauritania	Singapore	Yemen
Chile	Indonesia	Mexico	Slovenia	Zambia
China	Iran	Moldova	Somalia	Zimbabwe
Colombia	Iraq	Morocco	South Africa	
Costa Rica	Ireland	Mozambique	Spain	

B. Overdispersion and zero-inflated evidence

B.I Overdispersion evidence

Democracy	Mean	Variance	N
-10	1.4069	12.826	145
-9	2.6591	59.789	308
-8	1.4648	38.033	213
-7	3.0461	358.8	846
-6	13.253	2229.8	241
-5	23.506	4123.7	81
-4	11.244	1536.3	78
-3	23.551	3886.6	98
-2	8.5878	3874.7	131
-1	15.869	2628.1	99
0	24.074	5146.2	121
1	15	564.13	49
2	19.133	6573	45
3	17.741	721.77	58
4	15.438	2237.4	121
5	20.394	3630.1	155
6	23.23	3299.7	248
7	48.549	16867	164
8	43.197	9348.9	325
9	31.011	5533.3	263
10	15.59	1853.8	842
Total	16.088	3164	4631

B.II Zero-inflated evidence

Figure 10: Histogram for the total number of terrorist attacks

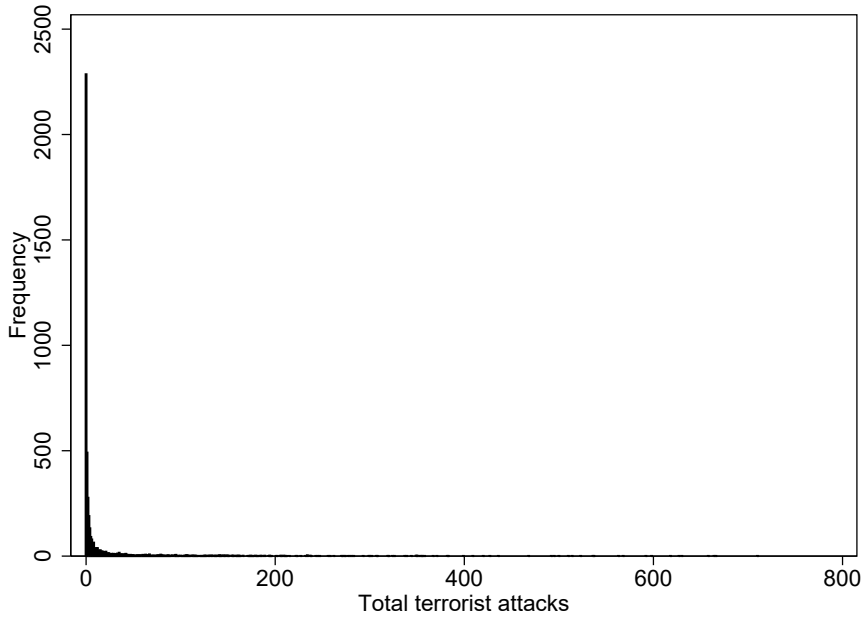
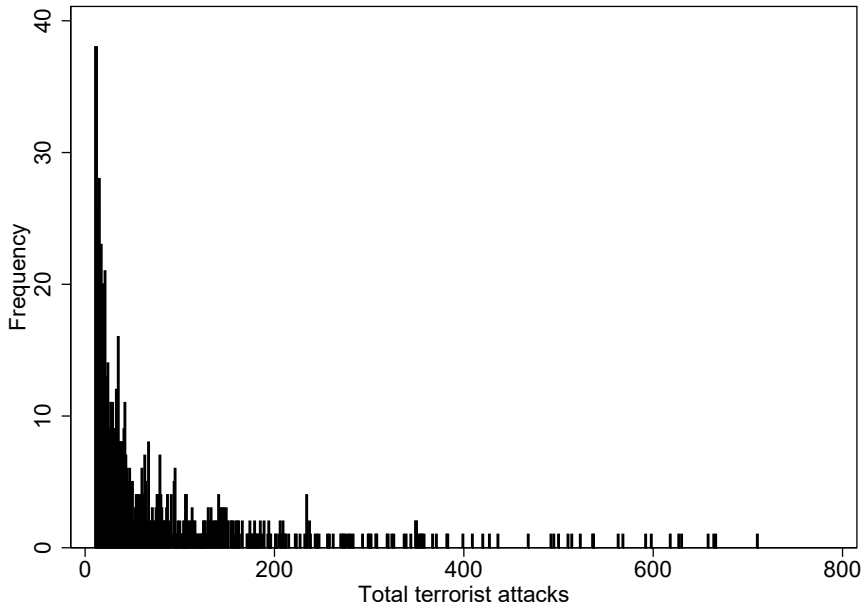


Figure 11: Histogram for the number of terrorist attacks (greater than 10 attacks)



C. Robustness checks

C.I Controling for fractionalization types, average elevation and tropical area

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ZINB					
Negative binomial						
Real GDP per capita(logged)	4.338***	4.236***	4.257***	4.053***	4.071***	3.997***
	(0.731)	(0.697)	(0.721)	(0.702)	(0.747)	(0.749)
Real GDP per capita (sq,logged)	-0.222***	-0.218***	-0.221***	-0.208***	-0.210***	-0.200***
	(0.042)	(0.041)	(0.042)	(0.041)	(0.043)	(0.043)
Economic growth	-0.019***	-0.019***	-0.018***	-0.018***	-0.018***	-0.018***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Population(logged)	0.559***	0.567***	0.540***	0.548***	0.559***	0.567***
	(0.043)	(0.044)	(0.043)	(0.046)	(0.047)	(0.047)
Consumption(logged)	0.214	0.086	0.110	0.146	-0.020	-0.002
	(0.161)	(0.174)	(0.173)	(0.169)	(0.163)	(0.163)
Investment(logged)	-0.313***	-0.279***	-0.253***	-0.334***	-0.301***	-0.276***
	(0.083)	(0.086)	(0.084)	(0.084)	(0.082)	(0.081)
Government size(logged)	0.638***	0.679***	0.581***	0.701***	0.583***	0.630***
	(0.090)	(0.089)	(0.089)	(0.092)	(0.089)	(0.092)
Trade openness(logged)	-0.838***	-0.827***	-0.876***	-0.830***	-0.770***	-0.772***
	(0.074)	(0.071)	(0.071)	(0.078)	(0.079)	(0.077)
Regime stability	-0.005***	-0.005***	-0.005***	-0.004***	-0.003**	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Civil war	1.581***	1.367***	1.574***	1.396***	1.369***	1.354***
	(0.121)	(0.130)	(0.120)	(0.125)	(0.127)	(0.130)
GFI * Area (logged)	0.261**	0.430***	0.358***	0.416***	0.330**	0.345**
	(0.128)	(0.128)	(0.125)	(0.137)	(0.134)	(0.138)
Religion Frac. (logged)	-0.068*			-0.086*	-0.073	-0.091*
	(0.041)			(0.049)	(0.048)	(0.048)
Language Frac. (logged)		0.027		0.105**	0.043	0.028
		(0.034)		(0.048)	(0.049)	(0.049)
Ethnic Frac. (logged)			-0.179**	-0.170**	-0.116	-0.147*
			(0.070)	(0.080)	(0.079)	(0.078)
Average elevation					0.004***	0.001***
					(8.59e-05)	(9.57e-05)
Tropical area (fraction)						0.393***
						(0.150)
Constant	-25.64***	-26.14***	-24.43***	-24.65***	-23.76***	-24.21***
	(3.006)	(2.852)	(3.052)	(2.971)	(3.141)	(3.206)
Inflate						
Democracy	-0.376***	-0.368***	-0.375***	-0.366***	-0.372***	-0.372***
	(0.027)	(0.029)	(0.028)	(0.029)	(0.030)	(0.030)
Constant	-0.049	-0.236	-0.075	-0.256	-0.252	-0.270
	(0.190)	(0.215)	(0.191)	(0.216)	(0.214)	(0.216)
α	1.062***	1.047***	1.069***	1.051***	1.042***	1.038***
	(0.033)	(0.034)	(0.033)	(0.034)	(0.034)	(0.034)
Regional dummies	YES	YES	YES	YES	YES	YES
Time effects	YES	YES	YES	YES	YES	YES
Observations	3,773	3,630	3,757	3,614	3,531	3,531

Note: Dependent variable is total terrorist attacks per year. α indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; *** p<0.01, **p<0.05, *p<0.1.

C.II Robustness checks for zero-inflated negative binomial estimations (clustered variance by year)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ZINB					
Negative binomial						
Real GDP per capita(logged)	5.626***	3.918***	4.483***	5.957***	3.952***	4.405***
	(0.941)	(0.840)	(0.927)	(0.970)	(0.856)	(0.868)
Real GDP per capita (sq,logged)	-0.292***	-0.199***	-0.231***	-0.308***	-0.200***	-0.227***
	(0.0515)	(0.0478)	(0.0514)	(0.0531)	(0.0487)	(0.0477)
Economic growth	-0.0220***	-0.0218***	-0.0225***	-0.0229***	-0.0225***	-0.0159***
	(0.00550)	(0.00557)	(0.00566)	(0.00569)	(0.00576)	(0.00549)
Population(logged)	0.497***	0.557***	0.508***	0.470***	0.553***	0.538***
	(0.0467)	(0.0451)	(0.0376)	(0.0474)	(0.0461)	(0.0360)
Consumption(logged)	0.770***	0.417**	0.474**	0.787***	0.342**	0.147
	(0.161)	(0.171)	(0.198)	(0.149)	(0.165)	(0.191)
Investment(logged)	-0.270***	-0.319***	-0.302***	-0.277***	-0.354***	-0.265**
	(0.0914)	(0.101)	(0.0946)	(0.0909)	(0.100)	(0.105)
Government size(logged)	0.680***	0.707***	0.701***	0.698***	0.702***	0.594***
	(0.117)	(0.121)	(0.118)	(0.119)	(0.122)	(0.115)
Trade openness(logged)	-0.765***	-0.712***	-0.809***	-0.781***	-0.728***	-0.875***
	(0.0727)	(0.0987)	(0.0756)	(0.0733)	(0.0972)	(0.0653)
Regime stability	-0.00763***	-0.00677***	-0.00643***	-0.00849***	-0.00749***	-0.00486***
	(0.000871)	(0.000890)	(0.000903)	(0.000921)	(0.000935)	(0.00140)
Civil war	1.574***	1.485***	1.500***	1.621***	1.517***	1.501***
	(0.112)	(0.107)	(0.114)	(0.113)	(0.107)	(0.111)
GFI (logged)	1.024***	0.728***	0.690***			
	(0.112)	(0.133)	(0.153)			
GFI * Area (logged)				0.645***	0.380***	0.329**
				(0.0998)	(0.129)	(0.128)
Constant	-33.53***	-24.50***	-66.14*	-35.21***	-24.03***	-25.84***
	(4.139)	(3.392)	(39.65)	(4.229)	(3.517)	(4.060)
Inflate						
Democracy	-0.348***	-0.381***	-0.382***	-0.350***	-0.385***	-0.398***
	(0.0237)	(0.0256)	(0.0265)	(0.0240)	(0.0266)	(0.0285)
Constant	-3.344***	-3.648***	-3.786***	-3.375***	-3.706***	-3.952***
	(0.225)	(0.239)	(0.234)	(0.226)	(0.246)	(0.265)
α	1.211***	1.184***	1.195***	1.233***	1.200***	1.066***
	(0.0675)	(0.0670)	(0.0678)	(0.0664)	(0.0658)	(0.0575)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869

Note: Dependent variable is total terrorist attacks per year. α indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; *** p<0.01, **p<0.05, *p<0.1.